SPONGE CELL ADHESION: AN EVOLUTIONARY ANCESTOR OF HISTOCOMPATIBILITY SYSTEMS ? *Memoirs of the Queensland Museum 44: 184. 1999*:- Sponges have been traditionally used as models to study cell adhesion because their rather loose and porous extracellular matrix allows a mild cell dissociation and the recovery of intercellular components in virtually native state. Species-specific cell recognition and adhesion in sponges is mediated by extracellular proteoglycan-like complexes termed aggregation factors (AFs), still not identified in higher animals. Polyvalent glycosaminoglycan interactions are involved in the species-specificity, representing one of the few known examples of a regulatory role for carbohydrates.

A surprising characteristic of sponges, considering their low phylogenetic position, is that they possess an exquisitely sophisticated histocompatibility system. Any grafting between two different sponge individuals is almost invariably incompatible in the many species investigated, exhibiting a variety of transitive qualitatively and quantitatively different responses, which can only be explained by the existence of a highly polymorphic gene system regulating sponge allogeneic reactions. The development of variable-region molecules is thought to have been a crucial event in the evolution of primordial vertebrate immune systems, followed by gene rearrangement to provide more diversity. Early in the evolution of the immune system, then, a gene must have duplicated to allow such diversity to arise. Unfortunately, there is an absolute lack of protein sequence information concerning the molecules involved in invertebrate histoincompatibility reactions. Recently, we deduced from cDNA the sequence of the aggregation factor core protein from the red beard sponge, *Microciona prolifera*, and Southern blot analysis suggested the existence of several related genes.

We have screened individual sponge cDNA libraries, identifying multiple related forms for the AF core protein (MAFp3). Northern blots show the presence in several human tissues of transcripts strongly binding a MAFp3-specific probe. We have studied tissue histocompatibility within a sponge population, finding 100% correlation between rejection behaviour and the individual-specific restriction fragment length polymorphism pattern using AF-related probes. PCR amplifications with specific primers showed that at least some of the MAFp3 forms are allelic and distribute in the population used. A pronounced polymorphism is also observed when analysing purified AF in polyacrylamide gels. Protease digestion of the polymorphic glycosaminoglycan-containing bands indicates that glycans are also responsible for the variability. The data presented reveal a high polymorphism of aggregation factor components which matches the elevated sponge alloincompatibility, suggesting an involvement of the cell adhesion system in sponge allogeneic reactions. Our present work will be discussed in the context of the evolution of histocompatibility systems and their possible divergence from primitive cell-cell interaction molecules. ❐ *Porifera, graft rejection, proteoglycans, invertebrate immunity, aggregation factors, cell adhesion, porifera genes, cDNA, histocompatibility.*

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